REMARKS

This application is a continued prosecution application under 37 C.F.R. § 1.53(d) of Applicants' copending application Serial No. 09/163,402, filed September 30, 1998.

Claims 1, 2, 4-8, 10-15 and 17-29 are now presented for examination. Claims 1, 2, 8, 13, 14 and 20 have been amended to define still more clearly what Applicants regard as their invention, in terms which distinguish over the art of record. Claims 1, 13 and 20 are the only independent claims.

The abstract and the claims have been objected to in the form PTO-892 attached to the Advisory Action mailed April 16, 2001 in that the recitation "revolutions of said blower in the stand-by state are made less than the revolutions in an in-operation-state" constitutes new matter. With regard to the abstract and claims as amended in this preliminary amendment, this objection is respectfully traversed.

As amended by this preliminary amendment, Claim 1 has the feature of control means controlling the blower according to the state of electrical discharging from a discharging electrode. The control means includes first means controlling rotation of the blower in a stand-by state in which no laser gas is excited by the electrical discharging from the discharging electrode and thus no laser light is emitted whereas an output of the laser light is being prepared and

second means controlling rotation of the blower in an in-operation state in which the laser gas is excited by the electrical discharging from the discharge electrode and the laser light is outputted. This feature of the invention is disclosed at least from line 3 of page 14 to line 15 of page 16 of the specification with respect to Fig. 5. The Abstract and Claims 13 and 20 have been similarly amended. A copy of the Abstract on a separate page is enclosed.

In the Office Action mailed June 13, 2000, Claims 1 and 20 were rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 5,770,933 to Larson, et al. With regard to the claims as amended by this preliminary amendment, this rejection is respectfully traversed.

As amended by this preliminary amendment, independent Claims 1 and 20 are directed an arrangement in which a laser gas is sealed in a chamber and is excited through electrical discharge using a discharging electrode. The laser light is amplified by a total reflection mirror and an output window which outputs a portion of the laser light amplified between the total reflection mirror and the output window. The laser gas is circulated within the chamber using a blower so that the laser gas passing an electrical discharging region of the discharging electrode is circulated in the chamber and is returned to the electrical discharging region of the

discharging electrode. The rotation of the blower is controlled according to the state of electrical discharging from the discharging electrode. The blower rotation control includes controlling blower rotation in a stand-by state in which no laser gas is excited by the electrical discharging from the discharging electrode so that no laser light is emitted but the output of the laser light is prepared and differently controlling the blower rotation in an in-operation state in which the laser gas is excited by the electrical discharging from the discharge electrode and the laser light is outputted.

In Applicants' view, Larson, et al. discloses a blower motor with adjustable timing for use in a compact excimer laser. The timing adjustment allows a specific motor's performance to be optimized by compensating for individual variations in rotor position sensor characteristics as well as their location. The rotor position sensors may be affixed to a heat sink within a portion of the motor housing. Cooling efficiency of the heat sink is improved by having at least a portion of the motor housing to which the heat sink is thermally coupled cooled through active or passive cooling. The rotor position sensors may be enclosed by a structure which improves their thermal and electrical isolation. Two brushless DC motors may be coupled to a single drive shaft and a command

signal to the motors is automatically varied to obtain a desired drive shaft speed. The drive shaft speed is continuously monitored and compared to a preset maximum limit. If the drive shaft speed equals or exceeds a preset limit the motors are temporarily disabled.

According to the invention defined in Claims 1 and 20, a blower for a gas laser device is controlled with the state of the electrical discharging of a discharge electrode. The blower rotation control includes differently controlling blower rotation in a stand-by state in which no laser gas is excited and in an in-operation state in which the laser gas is excited and laser light is output. Advantageously, the different blower rotation controls permits saving electrical energy consumed by the blower and increasing throughput.

Larson, et al. may disclose a motor that rotates a blower of a gas laser device and controlling the speed of the motor. It is disclosed at lines 17-29 of column 7 of Larson, et al. that a system controller monitors the speed of the two motors shown in Fig. 10 so that a controller can command either motor to increase or decrease drive current. The Larson, et al. disclosure, however, is devoid of any teaching or suggestion of determining the state of discharging electrode as stand-by or in-operation and controlling the blower rotation by a first blower rotation control in the stand-by state and a

second blower rotation control in the in-operation state as in Claims 1 and 20.

Larson also teaches controlling a blower motor to maintain a desired speed (line 10 to line 45 of column 8) and an overspeed control that turns a blower motor off for a 30 second period when the motor speed exceeds a set point (line 59 of column 7 to line 9 of column 8). Such control to obtain a single desired operating speed, however, fails to teach or suggest the feature of Claims 1 and 20 of a blower rotation control for a stand-by state and a different blower rotation control for an in-operation state. Accordingly, it is believed that Claims 1 and 20 as amended by this Amendment are completely distinguished from Larson, et al. and are allowable thereover.

In the Office Action mailed June 13, 2000, Claims 1, 2, 4 through 8, 10 through 15 and 17 through 29 were rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 4,611,327 to Clark, et al. in view of the Larson, et al. patent and U.S. Patent No. 5,383,217 to Uemura and the McKee publication. With regard to the claims as amended by this preliminary amendment, this rejection is respectfully traversed.

As amended by this preliminary amendment, independent Claim 13 is directed to exposure apparatus having a

laser source in which a discharging electrode excites a laser gas sealingly stored in a chamber by electrical discharging. A total reflection mirror amplifies laser light produced by the electrical discharging. An output window amplifies the laser light and outputs a portion of the laser light amplified between the total reflection mirror and the output window. A blower circulates the laser gas within the chamber so that the laser gas passing an electrical discharging region of the discharging electrode is circulated in the chamber and is returned to the electrical discharging region. A main assembly exposes a substrate to the laser light from the laser light source. A control unit controls the blower according to the state of the electrical discharging of the discharging electrode. The control unit has a first blower rotation control that controls the blower rotation in a non-exposure-operating state in which no laser gas is excited by the electrical discharging from the discharging electrode so that no laser light is emitted by the output of laser light is being prepared and a second blower rotation control that controls the rotation of the blower in an exposure state in which the laser gas is excited by electrical discharging from the discharging electrode and the laser light is outputted.

In Applicants' opinion, <u>Clark, et al.</u> discloses a high average power, high repetition rate pulsed gas transport

laser system in which a pulse forming network location minimizes electrical discharge loop inductance. RF shielding results from containment of the pulse forming network in a dielectric structure eccentrically mounted within a pressurizable vessel and forming a portion of a high-speed gas flow loop. A gas recirculating blower motor is mounted external to the pressurizable vessel and does not add to the laser system dimensions. The blower is coupled to the blower motor by a magnetic coupling. Blower speed and power can be readily changed. Corona or cold-cathode X-ray pre-ionization is provided in order to provide arc-free gas discharge. Materials compatible with the laser gases are used in construction.

Uemura, in Applicants' view, discloses exposure apparatus using a laser source in which timing of new gas addition and partial gas replacement is controlled so that the exposure apparatus is not adversely affected. The timing is such that gas introduction or replacement occurs during interruption of exposure operation, which does not start again until the fluctuation of the output of the laser light caused by gas introduction or replacement is stabilized.

McKee, in Applicants' view, discloses various techniques for use in spectral narrowing and tuning of excimer laser oscillators and outlines intra-cavity dispersive elements

including littrow grating, grazing-incidence gating, prisms and Fabry-Perot etalons using XeCl, KrF, ArF, XeF and F_2 transitions.

According to the invention of Claims 1, 13 and 20, a different blower rotation control is provided for the stand-by or non-exposure operating state in which laser light is not emitted and for the in-operation or exposure operation state in which laser light is output.

Clark, et al. may teach a gas transport laser system in which blower speed and power can be changed. The Clark, et al. speed change arrangement (lines 3 through 11 of column 12) discloses V-belt drives of the blower motor drive train as the structure for allowing adjustments in blower speed. Such V belt drive speed changes do not suggest any arrangement the provides one blower rotation control for stand-by or non-exposure operating states in which no laser gas is excited by the electrical discharging from said discharging electrode and another blower rotation control for in-operation or exposure operation states in which laser gas is excited by the electrical discharging from said discharging electrode as in Claims 1, 13 and 20.

As discussed with respect to Claims 1 and 20, Larson, et al.'s blower speed changing arrangements are not controlled by the state of electrical discharging of the

discharging electrode of a gas laser device. Accordingly, it is not seen that any combination of Clark, et al. and Larson, et al. could possibly suggest the feature of Claims 1, 13 and 20 different control of blower rotation in responsive to the state of electrical discharge of a discharging electrode in a gas laser device.

Uemura only teaches a semiconductor exposing apparatus that exposes a wafer to an excimer laser light. Since both Clark, et al. and Larson, et al. fail to suggest different blower rotation control according to the stand-by state or the in-operation state of electrical discharging of the discharging electrode of a gas laser device as in Claims 1, 13 and 20, it is not seen that the substitution of Uemura's exposing apparatus into Clark, et al., Larson, et al. or any combination thereof could possibly suggest the feature of Claims 1, 13 and 20 of different control of blower rotation according to the state of electrical discharge of a gas laser device discharging electrode.

McKee only teaches the use of XeCl, KrF, ArF, XeF and F_2 transitions so that the addition of McKee to Uemura's exposure apparatus combined with Clark, et al.'s and/or Larson, et al.'s gas laser devices that lack different blower controls based on electrical discharge state is not seen as suggesting the features of Claims 1, 13 and 20. It is therefore believed

that Claims 1, 13 and 20 as amended by this Amendment are completely distinguished from any combination of Clark, et al., Larson, et al., Uemura and McKee and are allowable.

U.S. Patents 6,144,686 (Hoffman et al. '686), 6,061,376 (Hoffman et al. '376), 6,023,486 (Hoffman et al. '486) and 6,195,378 B1 (Hoffman et al. '378) were cited in the advisory action mailed April 16, 2001. These references discloses a tangential fan and cutoff assembly that recirculates a lasing gas mixture having blade members, which vary in circumferential position stepwise from end to end, and/or a tapered anode assembly. The number of blade members can be constant or variable between ends. The circumferential position of blade members can shift monotonically or reversibly between ends. Blade members are stiffened by optimally selecting the number and placement of hub members to control the natural vibration frequency of the fan. Methods of forming tangential fans include casting, and machining from a solid block. Monolithic structures can be joined, typically by electron-beam welding. Casting, welding, and machining processes introduce no additional contaminants. Tangential fans produced have mechanical rigidity, accurate tolerances, and low contaminant concentrations. Blade members can be formed into air foil shapes.

The Hoffman et al. references are restricted to

constructional features of fans that recirculate a lasing gas mixture. None of these references, however, teaches or suggests the feature of control of blower rotation according to the state of electrical discharging from a discharging electrode which includes blower rotation control in a stand-by state in which no laser gas is excited by the electrical discharging from the discharging electrode and no laser light is emitted while an output of the laser light is being prepared, and different blower rotation control in an in-operation state in which the laser gas is excited by the electrical discharging from said discharge electrode and the laser light is being outputted as in Claims 1, 13 and 20.

A review of the art of record has failed to reveal anything which, in Applicants' opinion, would remedy the deficiencies of the art discussed above, as references against the independent claims herein. Those claims are therefore believed patentable over the art of record.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual consideration of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks and those in the Amendment filed January 10, 2001, Applicants respectfully request favorable consideration and favorable action on the merits.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE TO THE CLAIMS

1. (Three Times Amended) A gas laser device, comprising:

a chamber for sealingly storing a laser gas therein;

a discharging electrode for exciting the laser gas through electrical discharging;

a total reflection mirror for amplifying laser light produced by the electrical discharging from said discharging electrode;

an output window for amplifying the laser light and for outputting a portion of the laser light amplified between said total reflection mirror and said output window;

a blower for circulating the laser gas within said chamber, so that the laser gas passing an electrical discharging region of said discharging electrode is circulated in said chamber and is returned to the electrical discharging region of said discharging electrode; and

control means for controlling [revolutions of] said blower in accordance with a state of the electrical discharging from said discharging electrode [so that the revolutions of said

blower a stand-by state are made less than the revolutions in an in-operation state, wherein the stand-by state is a state], including first means for controlling rotation of the blower in a stand-by state in which no laser gas is excited by the electrical discharging from said discharging electrode and thus no laser light is emitted whereas an output of the laser light is being prepared, and [wherein the in-operation state is a state] and second means for controlling rotation of the blower in an in-operation state in which the laser gas is excited by the electrical discharging from said discharge electrode and the laser light is being outputted.

2. (Three Times Amended) A gas laser device according to Claim 1, wherein said [control means controls the revolutions] first rotation control means controls rotation of said blower when said gas laser device is in the stand-by state by stopping the blower.

8. (Three Times Amended) A gas laser device according to Claim 7, wherein said [control means controls the

revolutions] <u>first rotation control means controls rotation</u> of said blower when said gas laser device is in the stand-by state by stopping the blower.

13. An exposure apparatus, comprising:

a laser light source having (i) a chamber for sealingly storing a laser gas therein, (ii) a discharging electrode for exciting the laser gas through electrical discharging, (iii) a total reflection mirror for amplifying laser light produced by the electrical discharging from said discharging electrode, (iv) an output window for amplifying the laser light and for outputting a portion of the laser light amplified between said total reflection mirror and said output window, and (v) a blower for circulating the laser gas within said chamber so that the laser gas passing an electrical discharging region of said discharging electrode is circulated in said chamber and is returned to the electrical discharging region of said discharging electrode;

a main assembly for exposing a substrate to the laser light from said laser light source; and

control means for controlling [revolutions of] said

blower in accordance with a state of electrical discharging of said discharging electrode[, so that the revolutions of said blower in a non-exposure-operating state of the exposure apparatus are made less than the revolutions in exposure operation state of the exposure apparatus, wherein the non-exposure operation state is a state] <u>including first means for controlling rotation of the blower in a non-exposure-operating state</u> in which no laser gas is excited by the electrical discharging from said discharging electrode and thus no laser light is emitted whereas an output of the laser light is being prepared, and [wherein the exposure operation state is a state] <u>second means for controlling rotation of the blower in an exposure state</u> in which the laser gas is excited by electrical discharging from said discharging electrode and the laser light is being outputted.

14. (Twice Amended) An apparatus according to Claim 13, wherein said control means [increases] <u>further comprises means for increasing</u> [the] <u>a</u> [revolution] <u>rotation</u> speed of said blower in response to a start of an exposure job in which the exposure operation is performed through said main assembly.

20. (Three Times Amended) A semiconductor device manufacturing method comprising:

sealingly storing a laser gas in a chamber;

exciting, using a discharging electrode, the laser gas through electrical discharge;

amplifying laser light produced by the electrical discharging from said discharging electrode by a total reflection mirror;

amplifying the laser light by an output window and outputting a portion of the laser light amplified between said total reflection mirror and said output window;

circulating, using a blower, the laser gas within the chamber, so that the laser gas passing an electrical discharging region of the discharging electrode is circulated in the chamber and is returned to the electrical discharging region of the discharging electrode; and

controlling [revolutions] <u>rotation</u> of the blower in accordance with a state of electrical discharging from said discharging electrode[, so that the revolutions of the blower in a stand-by state are made less than the revolutions in an in-operation state, wherein the stand-by state is a state]

including controlling rotation of the blower in a stand-by state in which no laser gas is excited by the electrical discharging from said discharging electrode and thus no laser light is emitted whereas an output of the laser light is being prepared, and [wherein the in-operation state is a state] differently controlling rotation of the blower in an in-operation state in which the laser gas is excited by the electrical discharging from said discharge electrode and the laser light is being outputted.